

Polish Palatal Assimilation in Prefixed Words

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Introduction

Polish has Palatal Assimilation (henceforth PA) which requires that the palatalising feature be spread from a palatalised segment onto the preceding consonants.¹ This is illustrated in (1).²

- (1) ja[sn]y ja[śń]ejszy ‘light’ vs. ‘lighter’
 gwia[zd]a gwie[źź]e ‘star’, NOM-SG vs. LOC-SG
 kome[nd]a kome[ńń]e ‘command’, NOM-SG vs. LOC-SG

For example, due to PA in *ja[śń]ejszy* ‘lighter’ the front vowel [e] palatalises not only [n] to [ń], but also [s] to [ś].³

- ¹ I would like to thank Colin Ewen, Harry van der Hulst, Krisztina Polgárdi, Alan Prince, Jeroen van de Weijer and the anonymous reviewer for useful comments. The usual disclaimers apply.
² Examples in this paper will be mainly given in Polish spelling. Below we explain some of its orthographic conventions as well as the transcription which follows the Slavist tradition.

Spelling	Transcription	
c, dz	[c ʒ]	denti-alveolar affricates
cz, dż	[č ž]	postalveolar affricates
sz, ż/rz	[ʃ ʒ]	postalveolar fricatives
ć/ci, dź/dzi	[č ʃ]	prepalatal affricates
ś/si, ź/zi	[š ž]	prepalatal fricatives
ń/ni	[ɲ]	prepalatal nasal
ch/h	[x]	velar fricative
w	[w]	labiodental fricative
ł	[ɫ]	bilabial glide (IPA [w])

- As far as vowels are concerned, *ó* is phonetically identical to *u* [u], *y* is a high back unrounded vowel, while *e* and *ę* denote the front and the back nasal vowel, respectively. Orthographic *i* in front of a vowel denotes palatalisation of the preceding consonant.
³ The segmental changes brought about by PA are the same as the effects of palatalisation in Polish. However, not all consonants which may undergo palatalisation are also involved in PA. The correspondences between relevant consonants and their palatalised congeners are provided below.

Similar phenomena can optionally take place between words within the phrase, but there are some differences. For instance, the consonant spreading the palatalising feature cannot be a sonorant. Examples of phrases with optional PA are given in (2)a below, while those with no PA are given in (2)b (where '#' marks the word boundary).

- | | | | | |
|-------|-----------------|----|------------------|-----------------------|
| (2) a | te[n#ć]eń | or | te[ń#ć]eń | 'this shadow' |
| | chló[t#ż]imy | or | chló[ż#ż]imy | 'cold of winter' |
| b | la[s#l]iściasty | | *la[ś#l]iściasty | 'leaved forest' |
| | tera[s#ń]e ma | | *tera[ż#ń]e ma | 'now there isn't any' |

The behaviour of prefixed words with respect to PA shows a curious mixture of that typical of non-prefixed words and that of phrases. Most prefixed words pattern with phrases in allowing *optional* PA across the prefixal juncture (cf. (3)a below) and in disallowing spreading from a sonorant (3)b. However, in some words PA seems to be *obligatory*, just like in non-prefixed words (3)c. Consider a few examples (where '=' marks the prefix boundary).⁴

- | | | | | |
|-------|--------------|----|---------------|---------------|
| (3) a | ro[s=ć]inać | or | ro[ś=ć]inać | 'to cut open' |
| | [z=ż]erać | or | [ż=ż]erać | 'to tear off' |
| b | [z=ń]iszczyc | | *[ż=ń]iszczyc | 'to destroy' |
| | [z=l]iczyć | | *[ż=l]iczyć | 'to count' |
| c | *[s=ć]erać | | [ś=ć]erać | 'to wipe out' |
| | *[s=ć]eknąć | | [ś=ć]eknąć | 'to drip' |

The fact that prefixed words generally function differently in phonology from non-prefixed words has received attention in the literature (see, e.g. Szpyra 1989, Rubach and Booij 1990). The exceptional behaviour of the words exemplified in (3)c has also been noted, but no account has been offered.

In what follows I propose an Optimality-Theoretical analysis of the PA patterns illustrated above. I will argue that the different behaviour of the words in (3)c is due to the specific properties of their output structure. For

Non-palatalised

t, d
s, z
n
ɫ

Palatalised

ć/ci, dź/dzi
ś/si, ż/zi
n/ni
ɫ

Of coronals, PA does not affect the so-called 'hardened palatals': denti-alveolar affricates [c] and [ɟ], the postalveolar fricatives [ʃ] and [ʒ] or the affricates [tʃ] and [dʒ]. These consonants also escape palatalisation.

⁴ Examples in this paper involve prefixed verbs. Prefixed words of other categories follow the same patterns.

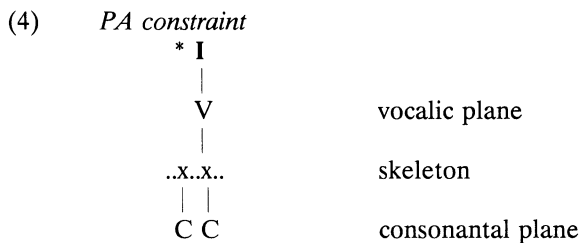
these words the optimal output is that in which the prefix consonant and the root-initial consonant are parsed as a single complex segment. The analysis will bear on the prosodic organisation of prefixed words and on the structure of complex segments in Polish.

This paper is organised as follows. In § 1 I present the framework adopted in the following analysis and the summary of facts concerning PA in Polish. In § 2.1 I show that what looks like obligatory PA across the prefixal juncture involves only consonantal sequences which can form complex segments. In § 2.2 the prosodic structure of prefixed words is considered. § 3 concludes.

1. Preliminaries

1.1 Framework. The theoretical approach applied in this paper is that of Optimality Theory (henceforth OT) developed by Prince and Smolensky (1993). Following their convention, names of OT constraints are given in (small) capitals. However, for segmental representation I adopt a single-valued feature framework developed in van de Weijer (1992) and (1993). Moreover, Jacobs and van de Weijer (1992) propose that secondary palatalisation on a consonant should be expressed as a vocalic superimposition, specifically by a frontness feature (here the vocalic element **I**). I assume that this is an adequate phonological representation for palatalisation of consonants in general. In the case of coronals and velars the vocalic specification is incorporated into the segment's consonantal melody, plausibly at a late phonological level, which affects the place of articulation and results in affrication of stops.

Within OT, assimilation of any kind is not understood as a rule, but as a property of outputs which best meet the hierarchy of well-formedness constraints. The relevant PA constraint can tentatively be stated as the requirement that the vocalic feature **I** should not be linked to one segment if another potential target precedes. It can be formalised as in (4):



In this paper I will not discuss the precise formalisation of the constraint. Neither will I deal with the differences between PA at the word level and

within the phrase. Let me only observe that distinct formulations of PA for various levels are not conceivable within OT, which claims all constraints to be universal. However, given that at each phonological level the PA constraint may be ranked differently with respect to others, its effects may also differ. A characteristic of phrase-level PA such as the exclusion of sonorants may be expected to follow from a higher ranked constraint relating to segmental structure. Additional evidence in favour of such a constraint comes from a similar asymmetric behaviour of sonorants within the word and within the phrase in voice assimilation in Polish (see Gussmann 1992a).

Constraints in OT may not be optional. I suggest that the optionality of PA within the phrase involves the optionality of the phrase-level phonological component as a whole. The prediction is that an utterance where phrase-level PA is observed must also exhibit other phenomena characteristic of this level, such as phrase-level voice assimilation, and vice versa. There can be no phrase-level voice assimilation where phrase-level PA is not observed. (Both possibilities are illustrated by the second example in (2)a above.) This seems to be a valid prediction which in no way follows from an approach where every individual rule can be optional.

1.2 PA - *summary of facts*. Facts concerning PA are summarised in the following chart.

(5)

	Target	Trigger	Application
PA - in words	[s z n]	[t d p b s z m n l]	obligatory
PA - in phrases	[t d s z n]	[t d s z]	optional
PA - in prefixed words	[t d s z] [s]	[t d s z] [t]	optional obligatory

Within the word PA is obligatory. The palatalising feature spreads from a coronal or bilabial obstruent or sonorant, other than [r], onto a coronal fricative or nasal. Within the phrase PA is optional. The palatalising feature spreads from a coronal obstruent, but not from a sonorant. The target is also a coronal obstruent (including plosives) or [n]. Across the prefixal juncture PA generally applies in the same way as within the phrase. The palatalising feature spreads optionally from a coronal obstruent onto another coronal obstruent. Since there are no prefixes in Polish that end in a nasal, there is no context where PA may affect [n] across the prefixal juncture.

PA at all levels may apply across underlying ‘yers’, i.e. vowels alternating with zero, if they are not realised phonetically. See some examples in (6).

(6)	[sen]	'dream'	[śń]e	'idem-LOC-SG'
	o[set]	'thistle'	o[ść]e	'idem-LOC-SG'

The 'transparency' of yers with respect to PA will not be considered here.

As mentioned above, there is a class of words where PA seems to be obligatory across the prefixal juncture. Examples, including those from (3)c, are provided in (7) below.

(7)	*[s = ċ]erać	[ś = ċ]erać	'to wipe out'
	*[s = ċ]eknać	[ś = ċ]eknać	'to drip'
	*[s = ċ]ać	[ś = ċ]ać	'to cut down'
	*[s = ċ]ągnąć	[ś = ċ]ągnąć	'to pull down'
	*[s = ċ]eśnić	[ś = ċ]eśnić	'to squeeze'

The context is very restricted: all cases involve spreading from (palatalised) [t] onto [s] which comes from the prefix /z-/. To treat such words as pure exceptions is to miss a generalisation.

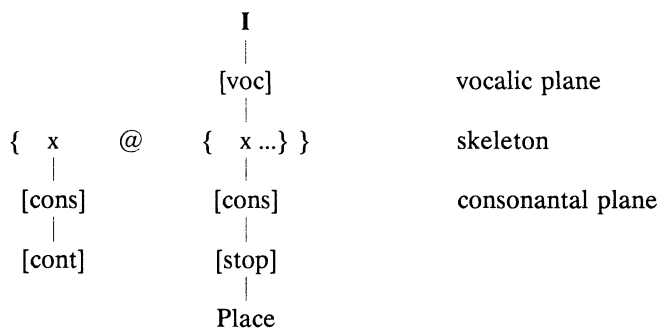
In the next section I will show that the words in (7) contain consonant sequences which can be parsed as single complex segments, and I will postulate a prosodic well-formedness constraint which can force such parsing.

2. Analysis

2.1 [ść] as a complex segment. All the words exemplified in (7) begin with the cluster [ść], where the fricative is the prefix consonant and the affricate is root-initial. I assume that the affricate is underlyingly /t/ with a vocalic feature I (cf. § 1.1). The special status of /s/ plus stop consonant sequences has often been observed in the literature (see Kuryłowicz 1975; Selkirk 1982; van de Weijer 1992, 1993). To account for their phonological behaviour it has been proposed that they constitute some kind of complex segment. I suggest that in the selected outputs of the words in (7) the cluster /st/ across the prefixal juncture is parsed as such a complex segment /<st>/. The vocalic feature I linked to the complex segment affects its head, while the dependent branch assimilates in place to the head. What looks like PA across the prefixal juncture in (7) in fact involves place assimilation within a complex segment.

Consider the segmental structure of [st] clusters across the prefixal juncture. It is given below (where '@' represents tentatively an underlying yer and curly brackets mark the morphological structure):

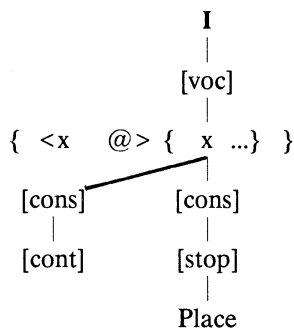
(8)



The fricative underlyingly has a skeletal position of its own, a consonantal root node and the Manner feature [continuant]. It is separated from the root consonant by an underlying yer. The representation of yers is far from established (for various proposals see, e.g. Rubach 1986, Gussmann 1992b and Szpyra 1992). However, yers which are not realised phonetically do not block interaction between consonants, such as PA and voice assimilation.

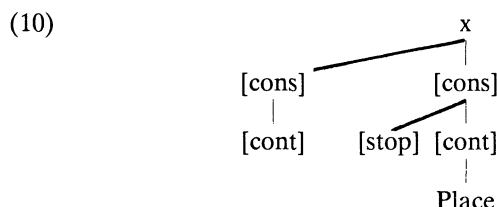
The sequence represented above can be parsed into a two-root complex segment with a minimal loss of input material. If the x-slot of the prefix fricative and the unvocalised yer are left unparsed, the melody of the fricative, i.e. its consonantal root node and Manner specification, may instead be associated to the skeletal position of the following stop. The candidate output generated in this way is given in (9) (where '<>' contains the unparsed material):

(9)



I propose that (9) represents the selected output structure of the word-initial clusters in (7). It is essential that each branch of the complex segment above has its own root node. The palatalised head branch surfaces as an affricate [č], which has itself been analysed as a complex segment containing two Manner specifications, [stop] and [cont], under one root node (see van de

Weijer 1992). Since one root node cannot support three Manner features, and two identical [cont] features could then hardly be kept distinct, [šć] can only be represented as a two-root complex segment, or as a sequence of two consonants. Given that [šć] as well as another fricative plus affricate cluster in Polish, namely [šč], function as palatalised congeners of complex segments /st/ and /sk/, respectively, and exhibit the same phonological behaviour as monosegmental /s/ plus stop clusters, they should also be analysed monosegmentally. I therefore suggest representing them as two-rooted complex segments, as shown below.



The analysis of [šć] and [šč] reveals that in /s/ plus affricate clusters the Place specification of the branch /s/ in the selected output is identical to the head of the affricate. Given no ordering between the affricate's branches (see van de Weijer 1992), the two [cont] nodes are adjacent. The palatalised quality of [š] in [šć] may then be due to place assimilation between spirants, a phenomenon well-known from many languages, and not to PA.

A feature which has been left out of the representations in (8) and (9) is the underlying [voice] specification of the prefix consonant. An undominated constraint in Polish demands that obstruent clusters agree in voicing. Therefore only outputs are selected in which before a voiceless consonant the feature [voice] of the prefix consonant is unparsed. Voiced consonants across the prefixal juncture cannot apparently be parsed into a complex segment since they are only subject to optional PA. Compare the word [šć]erać from (7) with [zš]erać ~ [žš]erać from (3)a. Cross-linguistically voiced complex segments are more rare than voiceless ones (see Maddieson 1984). This suggests that there is a constraint NO VOICED COMPLEX SEGMENTS. In Polish NVCS must be ranked higher than the one which forces parsing consonants into complex segments across the prefixal juncture (see § 2.2 below). Therefore candidate outputs with voiced complex segments created by the Generator are not selected. However, outputs with *underlying* voiced complex segments will not be discarded due to higher ranking of the constraint PARSE-*f(eature)* (Prince and Smolensky 1993) which requires parsing all input features.

The analysis proposed above provides an answer why the obligatory assimilation across the prefixal juncture illustrated in (7) involves only /s/

plus a voiceless stop consonant clusters: no other clusters in this position can be interpreted as complex segments. It has further been argued that the assimilation in question is not PA, but place assimilation between [cont] branches of a complex segment. Note that according to the formulation of the PA constraint in (4) the target for spreading the palatalising feature is a consonant occupying a skeletal position, which excludes segment-internal structure. The prediction is that even if a /sp/ cluster across the prefixal juncture becomes a complex segment, the palatalisation of the labial branch cannot affect the [cont] branch. Indeed, there are no prefixed words with obligatorily assimilated [šp'] clusters.

However, such an analysis forces a bisegmental interpretation of [šp'] and [zb'] clusters in non-prefixed words. If this turns out inaccurate, the PA constraint in (4) needs to be refined and another explanation for the non-occurrence of [šp'] clusters across the prefixal juncture is called for. A plausible alternative is at hand. Note that the dependent branch in a complex segment can only be a coronal: /s/ in /s/ plus stop clusters or /t/ in affricates. The special status of coronals have attracted a lot of attention (see, e.g. various contributions to Paradis and Prunet 1991). They have often been analysed as underspecified phonologically. It is conceivable that the Generator can create complex segments only out of such 'empty' segments, as far as both the dependent and the head are concerned, in which case only /s/ and /t/ are available. However, in order to decide in favour of either solution proposed above more needs to be known about the Generator and about segmental structure.

Parsing a sequence into a single segment involves unparsing a skeletal position. This violates another constraint of the PARSE family which can be labelled PARSE-*x*. However, all the input melodic substance is preserved, to the satisfaction of PARSE-*f*. Given the assumptions of OT, a constraint may be violated only in order to satisfy a dominating constraint. Below I will argue that the structure in (9) is *prosodically* superior to other candidate outputs. It satisfies a prosodic well-formedness constraint which is ranked higher than the violated PARSE-*x*.

2.2 Prosodic structure of prefixed words. Drawing on the results of Booij and Rubach (1987) and Szpyra (1989), I assume that in Polish the prefix is procliticised to the prosodic word (p-word) formed by the morphological root and suffix(es). Following Nespor and Vogel (1986), I will refer to the prosodic category containing a (pro)clitic and a p-word as the *clitic group*. The structure of a prefixed word in Polish can be represented in terms of prosodic bracketing as shown in (11).

- (11) $ClGr[Pref. PrWd[Root + Suffix(es)]PrWd]ClGr$

In OT the relationship between morphological and prosodic structure represented in (11) is due to a constraint of the ALIGNMENT type argued for in McCarthy and Prince (1993).

- (12) *ALIGN-L(-ROOT)*
Align (Root, L, PrWd, L)

ALIGN-L requires that the left edge of a morphological root coincides with the left edge of a p-word, thus excluding preceding prefixes from the same domain. I infer that the constraint also demands the alignment between the left edge of the p-word and the leftmost segment of the morphological root together with all elements of its segmental structure (i.e. features). It prohibits feature sharing between the prefix and the following root. (However, since McCarthy and Prince are not explicit in this respect, it may be a matter of interpretation of the constraint, as pointed out to me by the anonymous reviewer.) ALIGN-L is ranked high in Polish so that it regularly forces violations of the PA constraint across the prefixal juncture (cf. (3)a and (b)).

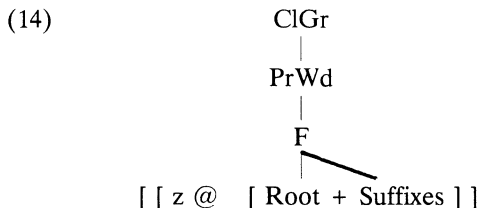
The output structure in (9) satisfies ALIGN-L: the leftmost constituent of the p-word is the leftmost segment of the morphological root. It is only the internal segmental composition of the root-initial consonant which differs from the input. However, this cannot be regarded as an ALIGN-L violation since no features are *shared* across the p-word edge. First, melodic features do *not* belong to the prosodic hierarchy as skeletal positions do. Addition or deletion of a feature of the edgemost segment does not affect morphology-prosody alignment, while addition or deletion of an x-slot at the edge does. Second, given no ordering of branches within a complex segment, the [stop] branch of the complex segment in (9) is initial in the p-word. However, candidate outputs in which the prefix fricative is parsed as a separate consonant also satisfy ALIGN-L, provided that the fricative and the following consonant do not share features. Parsing [st] into a complex segment proposed in § 2.1 must be due to another well-formedness requirement.

Observe that the words in (7) all contain the prefix *z-* which surfaces as a single consonant. Words containing the same stems as those in (7) but prefixed with *roz-* behave differently. Compare (13)a and (b).

- | | | | | | | |
|------|----|-------------|----|-------------|--|------------------|
| (13) | a. | *[s=ć]ǎć | | [ś=ć]ǎć | | ‘to cut down’ |
| | | *[s=ć]erać | | [ś=ć]erać | | ‘to wipe out-DI’ |
| | b. | ro[s=ć]ǎć | or | ro[ś=ć]ǎć | | ‘to cut open |
| | | ro[s=ć]erać | or | ro[ś=ć]erać | | ‘to grind-DI’ |

The crucial difference between the two prefixes, I claim, concerns foot structure. Rowicka and van de Weijer (in press) argue that prosodic foot structure plays a role in Polish lexicon. Crucially, the prefix and the root

constitute separate domains for such foot formation and yer vowels do not count for it. Accordingly, the prefix *roz-* can be parsed into a monosyllabic foot (with the vowel /o/ as the head), while the prefix *z-* cannot since it only has a yer and not a 'proper' vowel. Thus, in terms of prosodic structure a word prefixed with *z-* begins with an unfooted proclitic. Consider (14) (where square brackets mark prosodic structure).



It has been observed cross-linguistically that edges of prosodic categories at various levels preferably coincide with each other. For instance, the beginning of a p-word should coincide with the beginning of a foot (see ALIGN-PrWd in McCarthy and Prince 1993). I postulate that there is an analogous ALIGNMENT requirement on the well-formedness of clitic groups. It demands that the beginning (i.e. the left edge) of a clitic group should coincide with the left edge of a foot. ALIGN-ClGr can be formulated as in (15).

- (15) *ALIGN-ClGr*
Align (ClGr, L, F, L)

Words of the structure in (9) vacuously satisfy ALIGN-ClGr. The skeletal slots of the prefix are unparsed, the structure contains no proclitic at all and such words do not constitute clitic groups. ALIGN-ClGr is regularly violated in words prefixed with (voiced) *z-* and the other Polish monoconsonantal prefix *w-*. Their prosodic structure is that given in (14). Note, however, that /w/ cannot form a complex segment in Polish, while complex segments containing /z/ will be ruled out by the constraint NVCS (see § 2.1), which must be ranked above ALIGN-ClGr. ALIGN-ClGr is only satisfied by candidate outputs in which the whole proclitic prefix *w-* or *z-* is unparsed. However, such candidates are never selected, which can be attributed to the higher ranking of the melody-preserving constraint PARSE-*f(eature)*. The ranking of the relevant constraints is then the following: PARSE-*f* >> ALIGN-L >> NVCS >> ALIGN-ClGr >> PARSE-*x*, PA (where '>>' reads 'dominates' and comma separates constraints whose order is irrelevant here).

To illustrate the analysis, the following tableau provides the evaluation of a few candidate outputs for the clusters of /s/ plus palatalised /t/ across the prefixal juncture with respect to the relevant constraints. Square brackets

denote prosodic structure. In the first candidate the palatalising feature **I** is not spread. In the second it is spread across the p-word edge, as indicated by the double linking of the feature **I** across the square bracket. In the third the left edge of the p-word is aligned with the left edge of the prefix, instead of the root. In the fourth example the parentheses around (st) indicate that it is a complex segment, i.e. the structure involved is that from (9) above. In the fifth candidate the whole prefix is left unparsed. The phonetic output of the first candidate is [sɛ], that of the last [ɛ], while that of the other three is [ʃɛ].

(16)

Candidates	PARSE- <i>f</i>	ALIGN- L	NVCS	ALIGN- ClGr	PARSE- <i>x</i>	PA
I [s [t ..]]				*!		*
I ^ [s [t ..]]		*!		*		
I ^ [s t ..]		*!		vac.		
I ^ [(st) ..]				vac.	*	vac.
I <s>[t ..]	s!			vac.	*	vac.

As this tableau shows, the output form containing the complex segment is the optimal one (indicated by ✱). I conclude that (9) adequately represents the structure of the initial cluster of the words in (7).

4. Conclusion

In this paper I have discussed the apparently irregular behaviour of some prefixed words with respect to PA in Polish, and proposed an OT account of the problem. Prefixed words are subject to ALIGN-L constraint, which prohibits sharing the palatalising feature between the prefix and the root. In such words PA cannot be satisfied in word-level phonology, where it is outranked

by ALIGN-L, but only in phrase-level phonology, where the constraint hierarchy is different. A class of words prefixed with *z-* seems to violate ALIGN-L in satisfying word-level PA across the prefixal juncture. I have argued that the violation is only apparent. In these words the prefix fricative is parsed as a branch of a two-root complex segment with the following consonant. In this way ALIGN-CIGr is satisfied which demands a foot at the beginning of a clitic group, such as a prefixed word.

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